

AP[®] BIOLOGY
2003 SCORING GUIDELINES

Question 1 (continued)

(a) Maximum 4 points

- 1 pt Genotypes of the parents (words or symbols) $X^E Y$ (or $X^+ Y$) and $X^e X^e$
- 1 pt Discuss/show how these resulted in this F1 (may be annotated Punnett)
- 1 pt Explain that it is a sex-linked (X-linked) gene (not just the word)
- 1 pt How you know which type is dominant
- 1 pt F2 results (may be annotated Punnett square)

(b) Maximum 4 points

- 1 pt Correct F2 hypothesis (1:1:1:1; or 25/genotype)
- 1 pt Show work (components): $o \quad e \quad o-e \quad (o-e)^2 \quad (o-e)^2/e$
(or correct numbers $(4/25 + 36/25 + 1/25 + 9/25) = 50/25 = 2$; or at least the last term)
- 1 pt Sum: correct chi-square result ~ 2.0 or 1.85
- 1 pt degrees of freedom = 3 (critical value is 7.82)
- 1 pt correct interpretation of chi-square in terms of p
 p = probability that the difference between the observed and the expected value is due to chance alone.
This p value shows we accept our hypothesis.
The null hypothesis is supported in this case.
(alternative: 2 X^2 tests of white vs. red males and white vs. red females)

(c) Maximum 4 points

- 1 pt Explain what a mutation is: (heritable) change in the DNA (code)
- 1-2 pts Discuss 2 types of mutations
May be: Point mutation, frameshift (deletion/duplication), insertion, transposition, break, inversion within gene, base substitution, nonsense/stop, missense)
May NOT be: chromosomal aberration, nondisjunction, silent/neutral, transcription or translation or processing error
- 1 pt Molecular or biochemical elaboration beyond the explanation required